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"Twinblock Therapy Combined with Incorporated Prosthesis"- A Novel Approach for Simultaneous Treatment of Class II Skeletal Discrepancy and Rehabilitation of Missing Central Incisors

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Abstract: ***Twinblock appliance therapy is the most commonly and widely used myofunctional therapy employed for correction of Class II Skeletal pattern in the early growing stages of a patient before attaining maturation or puberty. It changes the typical convex profile of a patient into an almost straight or Orthognathic profile, a positive VTO (Visual Treatment Objective) as we call it, thus eliminating or avoiding the need for an encroaching Surgery for skeletal correction later on in life. If the appliance delivered to the patient is used meticulously with proper instructions, myofunctional appliances manifest their results efficiently withing 6 to 7 months of treatment. Results are best attainable if the patient uses the appliance for maximum hours in a day. This Case Report is of a 13 years old female patient with a Class II Skeletal pattern and a retrognathic mandible, with positive VTO and missing upper central incisors. She visited with the chief complaint of missing upper front teeth and wanted replacement for the same, also the patient complained of a backwardly positioned lower jaw. A Novel treatment approach was advocated for this patient, as both her problems had to be addressed, i.e. the missing maxillary central incisors and the retruded mandible. So, as a new approach, we decided to address both the problems simultaneously as the patient had very less time left for completion of maturation, so the retruded mandibular fault had to be addressed immediately. Also since the chief complaint being missing upper front teeth, that too was a matter of immediate esthetic concern as the patient was a growing school going girl and was worried about her unestheticlooks. So, we decided to design an appliance which addressed both these issues simultaneously and quickly. A normal Standard twinblock was fabricated with its palatal acrylic extended more anteriorly to incorporate the upper missing central incisors, both of right and left side. This served both purposes. Firstly, the patients chief complaint of missing front teeth was addressed, secondly the patients remaining growth was utilized for correction of the retruded mandibular position which in turn improved the profile of the patient drastically. Twinblock with incorporated prosthesis served dual purposes.***

1. Introduction

Functional appliances may be defined as orthodontic appliances that use the forces generated by the muscles to achieve dental and skeletal changes. These appliances have been used in clinical orthodontics for a long time and are extensively featured in the literature. Their effect is produced from the forces generated by the stretching of the muscles. It is a commonly used functional appliance partly due to its acceptability by patients.

Dentofacial orthopedic treatment can significantly alter and improve facial appearance in addition to correcting irregularity of the teeth. Functional appliance therapy can be used successfully in Class II malocclusion, e.g., in a growing patient. Twin blocks are simple bite blocks that interlock at a 70° angle and correct the maxillomandibular relationship through functional mandibular displacement. The twin block appliance was developed by Clark in 1980s. They modify the occlusal inclined plane, guiding the mandible forward into correct occlusion. The use of these appliances is greatly dependent on patient's compliance and they simplify the fixed appliance phase. The patients can function normally in twin blocks and can eat and speak without restriction of the normal movements of the tongue, lips, and mandibleIn this case, a 13-year-old adolescent was treated with twin block appliance with incorporated prosthesis with both upper central incisors for dual correction of both missing central incisors along with the correction of the class II skeletal discrepancy.

2. Case Report

A 13 year 7 month old female patient reported to the department of Orthodontics and Dentofacial Orthopedics at Sinhgad Dental college and Hospital, Pune with the chief complaint of missing upper front teeth and a backwardly placed lower jaw. On extraoral examination, the patient had a convex profile,grossly symmetrical face on both sides with a retruded chin, competent lips , deep mentolabial sulcus and an averageNasolabial Angle (99 degree), aLeptoprosopic facial form, Dolicocephalic head form, Average width of nose and mouth, minimal buccal corridor space, a consonant smile arc and posterior divergence of face . The patient had no relevant prenatal, natal, postnatal history, history of habits or a family history. Patient had not attained menarche yet. Past dental history comprised of Light cure restorations done with 36 and 46 one year back and oral prophylaxis

done six months back. Intraoral examination on frontal view shows presence of missing 11 and 12, on side views the patient shows the presence of Class II div 1 incisor relationship, an End on canine relationship on both sides and an end on molar relationship on both sides. Patient has an overjet of 6 mm(lateral incisors) and an overbite of 5mm. The upper arch shows the presence of a V shaped arch form and lower arch shows the presence of a V shaped arch form. OPG of the patient shows presence of all four 3rd molars in a developing stage. Hand wrist radiograph shows SMI stage 3. Cephalometric analysis readings are as follows:-

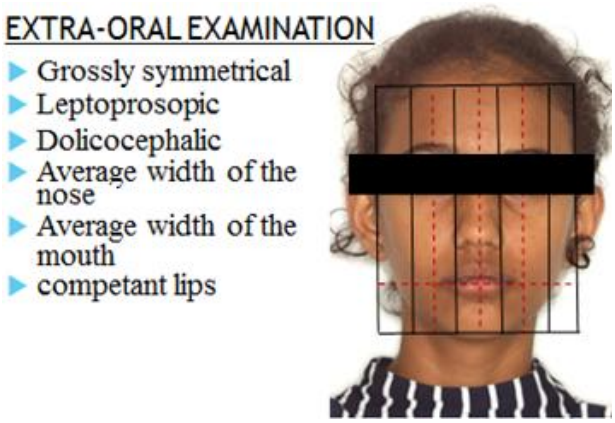
1) Steiners analysis shows a retrognathic maxilla and mandible, Class II Skeletal pattern, a Vertical growth pattern, proclined maxillary and mandibular anteriors, forwardly placed maxillary and mandibular anteriors and protrusive upper and lower lips
2) Tweeds analysis shows a vertical growth pattern and proclined mandibular incisors
3) Wits appraisal shows AO ahead of BO by 3 mm indicating Skeletal Class II pattern
4) Ricketts analysis shows retropositioned condyles and proclined mandibular anteriors
5) McNamara analysis shows a retrognathic maxilla, retrognathic mandible, a vertical growth pattern, increased lower anterior facial height and proclined mandibular incisors
6) Rakosijaraback analysis shows a vertical growth pattern and proclined maxillary and mandibular incisors
7) Holdaway soft tissue analysis shows increased maxillary and mandibular sulcus depth and increased strain of lips
8) Downs analysis shows a retropositioned chin, a Class II Skeletal pattern, a vertical growth pattern and proclined maxillary and mandibular anterior teeth

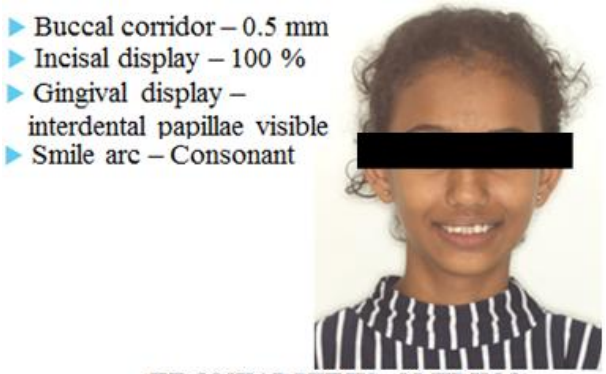
Individual Cephalometric Analysis charts are given in the case presentation below:-

Case was presented by Dr. Lishoy Rodrigues, I MDS, Department of Orthodontics and Dentofacial Orthopedics

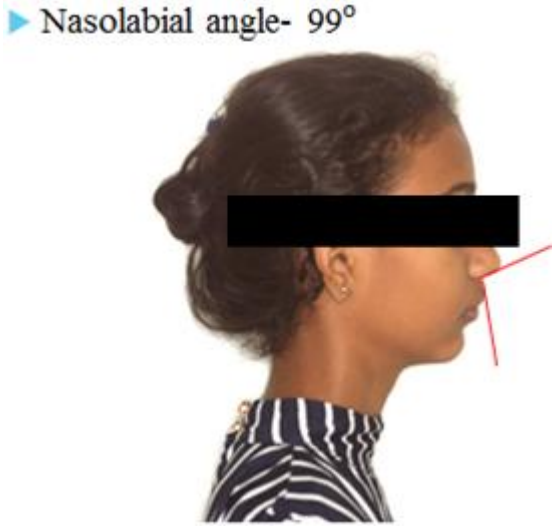
Patient History

- **Patient's Name:** Swarali Rahull Varghade
- **Age:** 13 years 7 months
- **Gender:** Female
- **Chief Complaint:** Patients complains of missing upper front teeth and wants treatment for the same
- **Pre Natal History:** No relevant history (as elicited by the patient)
- **Natal History:** No relevant history (as elicited by the patient)
- **Post Natal History:** No relevant history (as elicited by the patient)
- **Family History:** No relevant history (as elicited by the patient)
- **History of habits:** No relevant history (as elicited by the patient)
- **Medical History:** Fracture with 11, 21 while playing 2 years ago





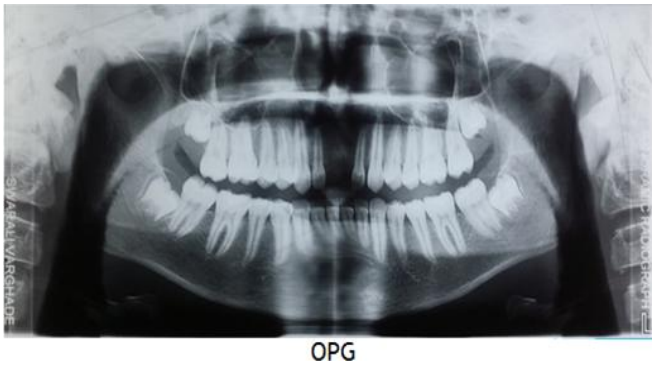
FRONTAL VIEW : SMILING



VTO Positive

FRONTAL VIEW

Mandibular arch



OPG

INTRA-ORAL EXAMINATION

Maxillary arch

HAND-WRIST RADIOGRAPH

Occlusion

- Incisor relationship : Class II div 1
- Canine relationship : Class II on both sides
- Molar relationship: Angle's Class II on both sides
- Overjet: 6mm
- Overbite: 5mm

LATERAL CEPHALOGRAM

Steiner's Analysis

Measurement	Mean	Pre Rx	Inference
SNA	82°	72°	Retrognathic maxilla
SNB	80°	69°	Retrognathic mandible
ANB	2°	3°	Class II skeletal pattern
Go-Gn to Sn	32°	33°	Vertical growth pattern
U1 to NA angle	22°	38°	Proclined max incisors
U1 to NA mm	4mm	10mm	Forwarly placed max incisors
L1 to NB angle	25°	30°	Proclined man incisors
L1 to NB mm	4mm	8mm	Forwardly placed man incisors
Interincisal angle	130°	110°	Proclined upper and lower anteriors
Occlusal plane - SN	14°	18°	Increased
'S' Line U Lip L Lip	 0mm 0mm	 1 mm 2mm	Protrusive upper and lower lips

TWEEDS Analysis

Measurement	Mean	Pre Rx	Inference
FMA	25^0	29^0	Vertical Growth Pattern
FMIA	65^0	46^0	
IMPA	90^0	105^0	Proclined Lower incicor

Wits Appraisal

AO ahead of BO by 3 mm
Signifying Class II skeletal pattern

Ricketts Analysis

Measurement	Mean (for 9 yrs)	Pre Rx	Inference
Facial axis(Ba-Na to Pt-Gn)	90± 3.5°	83°	Retropositioned chin
Facial angle(N-pg to FH)	87± 3°	77°	Retropositioned chin
Mandibular plane angle	26± 4.5°	29°	Average growth pattern
Convexity at Pt.A	2± 2mm	0 mm	Average maxilla
L1 to A - Pg	1± 2 mm	7 mm	Proclined mandibular incisor
U6 to Ptv	Age + 3 yrs	9 mm	
L1 inclination	22± 4°	32°	Proclined mandibular incisor
Lower lip to E plane	-2 ±2 mm	2 mm	Average

MC NAMARA Analysis

Measurement	Mean	Pre Rx	Inference
N perp - A	0 -1mm	11 mm	Retrognathic maxilla
N perp to Pog	0-4 mm	-23mm	Retrognathic mandible
Facial axis angle	0± 3.5°	-5°	Vertical growth pattern
Mand. Plane angle	22 ± 4°	30°	Vertical growth pattern
Eff. Maxillary Length		73 mm	Vertical growth pattern
Eff. Mandibular Length		97mm	Decreased
Maxillomandibular differential		24 mm	Average value
Lower ant. Facial ht.		62 mm	Increased LAFH
U1 to Pt. A	4-6 mm	5 mm	average max. incisors
L1 to A-Pog	1-3mm	7mm	Proclined man. incisors
Nasolabial angle	102 ± 8°	99°	Average nasolabial angle
Pharyngeal analysis U L	15-20 11-14	19 mm 11 mm	Adequate upper and lower airway passage

RAKOSI JARABAK Analysis

Measurement	Mean	Pre Rx	Inference
Saddle angle	123± 5°	124°	Average
Articular angle	143± 6°	151°	Increased
Gonial angle	128± 7°	120°	Vertical growth pattern
Upper gonial angle	52-55°	47°	Vertical growth pattern
Lower gonial angle	70-75°	74°	Average
Sum of posterior angles	396± 6°	395°	Average
Mandibular plane angle	32°	32°	Normal
Angle of inclination	85°	89°	Increased
Basal plane angle	25°	32°	Vertical growth pattern
Palatal plane to occlusal plane	11°	10°	Average
Occlusal plane to MP	14°	21°	Vertical growth pattern
Post to Ant. Face ht. ratio	62-65%	63.30 %	Average growth pattern
Y - axis	66°	66°	Average
U1 - SN	102± 2°	71°	proclined upper incisor
U1-Palatal plane	70±5	65	proclined upper incisor
L1 - MP	90± 3°	101°	Proclined lower incisor

Holdaways Soft Tissue Analysis

Measurement	Mean	Pre Rx	Inference
Facial angle	90± 3°	81°	Recessive lower jaw
Upper lip curvature	2-5 mm	1.5mm	Average
Skeletal convexity at Pt. A	2 ± 2 mm	0 mm	Average
H line angle	7 - 15°	20°	Average
Nose tip to H line	12 mm	2 mm	Average
Upper sulcus depth	5 mm	7 mm	Increased max sulcus depth
Upper lip thickness	15 mm	18 mm	Increased max lip thickness
Upper lip strain	2 mm	5mm	Increased strain of lips
Lower lip to H line	-1 to +2mm	2 mm	Average
Lower sulcus depth	5 mm	6 mm	Increased man sulcus depth
Soft tissue chin thickness	10-12 mm	11 mm	Average

Downs Analysis

Measurement	Mean	Pre Rx	Inference
Facial angle	87.8° (82°-95°)	77°	Retropositioned chin
Angle of convexity	0° (-8.5°-10°)	0°	Average maxilla
Mandibular plane angle	21.9° (17°-28°)	29°	Vertical growth pattern
Y-axis	59° (53°-60°)	66°	Class II skeletal pattern
A-B plane angle	-4.6° (-9°-0°)	0°	Average
Cant of occlusal plane	9.3° (1.5°-14°)	12°	Average
Interincisal angle	135.4 +/- 5.8	112°	Proclined max and man incisors
Incisor mandibular plane angle	1.4° (-8.2°-7°)	15°	Proclined man incisor
Incisor occlusal plane angle	14.5° (3.5°-20°)	32°	Proclined man incisor
U1- A-Pog		11 mm	Proclined max incisor

Model Analysis

Bolton ratio:-
Mandibular anterior excess:- 3.4 mm
Mandibular Overall excess:- 0.7 mm

Arch Perimeter Analysis :
Indicates need to extract second premolars

Ashley Howe's index:-
Borderline case for extraction

Careys Analysis :
Indicates need for proximal stripping

Pont's Index :
Expansion needed

Chadda's Index :
Expansion needed

Problem List

	Anteroposterior	Vertical	Transverse
Dental	➢ Rotated 12,13,22,23,31,32.34. ➢ Crowding in lower anteriors ➢ Spacing between 12,13 and 14 and 22, 23 and 24		
Skeletal	➢ Class II skeletal pattern ➢ Retrognathic maxilla and retrognathic mandible	➢ Vertical growth pattern	➢ Constricted maxilla
Soft tissue	➢ Acute nasolabial angle ➢ Protrusive upper and lower lips		

Diagnosis

Swaralli Rahul Varghade, 13 years 6 months old female patient is diagnosed with Angle's Class II div 1 malocclusion with a retrognathic maxilla, retrognathic mandible and a vertical growth pattern, increased overjet and overbite, proclined upper and lower incisors, mild crowding in the lower anterior region, deep mentolabial sucluc and protrusive upper and lower lips.

Treatment Objectives

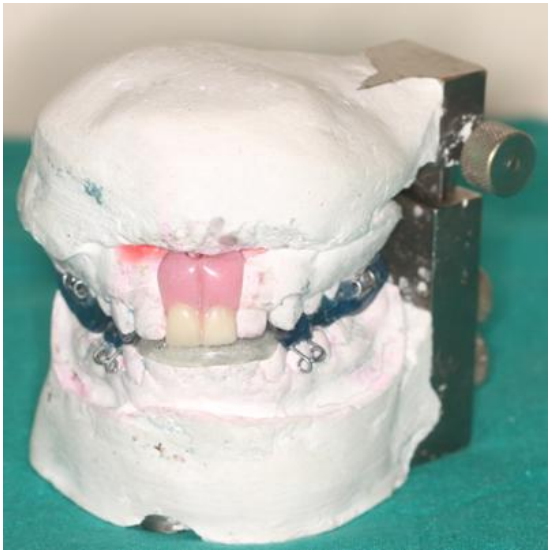
- To replace missing 11 and 21
- To correct maxillary retrognathism
- To correct mandibular retrognathism
- To correct proclination of upper and lower anteriors
- To correct overjet and overbite
- Too correct a deep curve of spee
- To achieve a pleasing profile

Treatment Plan

a) Myofuntional Therapy: Twinblock appliance with incorporation of prosthesis for 11 and 21
b) Appliance design:
   - Saggital advancement: 5 mm
   - Vertical opening: 5 mm
c) Evaluate for fixed orthodontic therapy

3. Treatment Plan

The treatment plan followed 2 phases of orthopedic and orthodontic correction. 1st phase involved correction of Sagittal Dysplasia using functional appliance therapy. The appliance used was a standard twinblock with a sagittal advancement of 5 mm and a vertical opening of 5 mm. Incorporated in the Twinblock was an acrylic extension of the palate anteriorly encompassing the space of the missing central incisors to replace them with artificial acrylic central incisors. The 2nd phase of treatment involved fixed orthodontic treatment with MBT 0.022 inch slot.



4. Treatment Progress

Construction bite of the patient was registered by training the patient to bite in the desired anterior position which corrected the profile and enabled a class I molar relation bilaterally. Construction bite was taken with 5mm advancement and 5 mm opening. Twinblock was fabricated with incorporation of prosthesis with 11 and 21. Appliance was delivered to the patient and proper post appliance delivery instructions were given. Follow ups were carried out regularly. Pterygoid response was observed in the patient within 28 days of delivery of the appliance. Trimming of the appliance was done in an occlusogingival direction at an interval of 3 weeks. Sagittal correction into a class I molar relation was achieved in 6 months.

(Construction bite was taken with 5mm advancement and 5 mm opening)

5. Discussion

Twin block functional appliance has several well established advantages including the fact that it is well tolerated by patients and it can be used in the mixed and permanent dentition.There are potential disadvantages such as the proclination of the lower incisors and development of posterior open bites. In this case, the treatment objectives were achieved largely due to good patient compliance

The patient's chief complaint was the missing upper front teeth and a backwardly placed lower jaw. Thus, by incorporating the prosthesis for the missing upper central and lateral incisor with the functional appliance, the patient's confidence improved; the patients concern of unesthetic upper incisors was also minimized.

The selection of functional appliances is dependent upon several factors which can be categorized into patient factors, such as age and compliance, and clinical factors, such as preference/familiarity and laboratory facilities.

During treatment, the SellaNasion angle (SNA) value was reduced by 10° whereas the SNB value was reduced by 11°. As a consequence, the (Maxillo mandibular skeletal angular sagital discrepancy) ANB value increased by 3° toward class II skeletal pattern. The myofunctional therapy resulted in an improvement in the patient's profile, which is largely attributed to the favorable growth and partly to the functional appliance.

It has been proved in the literature that functional appliances do not produce long-term skeletal changes and most of their effects are dentoalveloar. In a prospective controlled trial with twin blocks and controls to investigate the skeletal and dental effects showed that the ANB angle reduced by 2°, which was almost entirely due to mandibular length increase which was 2.4 mm compared to the controls as measured from Ar-Pog. There was no evidence of a restriction in maxillary growth.

In this case, providing both treatments immediately was mandatory to the patient as the technique employed here was blend of both Prosthodontics and Orthodontics , both of which required immediate addresal as the patient was worried about her esthetics as she was a young school going girl, also her growth required immediate adressal as there was very less of growth remaining. The patient had not attained her menarche yet.

Successful results were obtained after the myofunctional therapy within 6 months of time and the patient wore the appliance more because of the incorporated prosthesis than for skeletal correction itself because esthetics was her primary concern. So this modification indirectly helped and motivated the patient to use the appliance much more frequently than she would use otherwise if only skeletal correction were required. Indirectly, this novel modification also acted as a reminder therapy to the patie

(Pre Treatment Profile View)

(**Post Treatment Profile View)**

6. Conclusion

Incorporation of prosthesis in the Standard Twinblock appliance not only helped in correction of Skeletal Class II discrepancy and a retruded mandible, but also provided a temporary prosthesis to the patient which was of dire need, as the patient was a young growing girl with esthetic concerns. This novel approach of incorporating a prosthesis in the standard twinblock served two purposes, both of which were matters of immediate addresal, thus saving the patients time, expenditure and the need to seek dual treatments.

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